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ABSTRACT

Although computer use in a variety of educational environments has grown tremendously in the past five years, issues of who uses the computer and how they use it are arising. Preliminary research indicates that computer access is related to both socio-economic status (SES) and sex, with male students from wealthier school districts being most apt to have access to computers. SES is also related to computer use, with higher SES students being more apt to use computers in creative ways, and low SES students being more apt to use computers for remedial drill and practice. Access to computers is additionally influenced by geographic location, with the least amount of computer usage in the south, and ethnic background, with white native English speakers overwhelmingly predominating as computer users. As computers play an increasing role in society, and as studies provide additional evidence of the positive effects of computers on achievement and motivation, the problems of computer equity must be addressed and solutions found. A 17-item bibliography accompanies this paper. (Author/ESR)

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Computers in Education: A Question of Access

Access to Computers

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During the past five years, computer use in education has grown tremendously. As computers are used in a variety of educational environments, issues of who uses the computer and how arise. Preliminary research indicates that computer access is related to both socio-economic status (SES) and sex, with male students from wealthier districts being most apt to have access to computers. SES is also related to computer use, with higher SES students being more apt to use computers in creative ways, while lower SES students are more apt to use computers for rememdial drill and practice. As computers play an increasing role in society, and as studies provide additional evidence of the positive effects of computers on achievement and motivation, the problems of computer equity must be addressed and solutions found..

A paper presented to annual meeting of the American Educational Research Association, Montreal, Quebec, April, 1983

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Computers in Education: A Question of Access

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Micro-computers have taken education by storm and are becoming of increasing importance to our educational lives. Children are learning to program with BASIC, think with LOGO and improve their basic skills with any number of available software packages. Unlike earlier generations of educational panaceas, parents and most educators appear to be in agreement with federal, state and local governments that computers are the most important educational innovation since the printing press. Since their introduction, in the schools, in 1979, over 96,000 computers have been put into 29,000 of the 84,226 public school buildings, in this country. Approximatly 11% of elementary schools, 25% of junior high schools and 43% of senior high schools have at least one computer (Market Data Retreval, 1981). It is expected that this growth will continue and by, June of this year, over 36,000 schools (or almost 43%) will have computers.

Unlike previous educational innovations, this one is not being primarily funded, by government. Federal and state funds account for only about 30% of the funds allocated for computers. The other 70% come from local tax levies, industry gifts and everything from PTA car washes to bake sales (Lipkin, 1983). The primary determinant of who receives computer instruction, in this time of the "New Federalism" is not who needs it, but rather who can afford it.

Just recently people have begun to become concerned about where computers are located and who has access to them. As a recent letter to Education Week stated: "There is a great danger that computers may simply add to the inequity of our society by being adopted only in suburban upper class districts and in private schools (and homes) with boys being the favored users"(Education Week,

1983, p. 8). The teacher/author of that letter has a legitimate concern. Currently computers are disproportionatly located in larger districts serving wealthier populations. For example, less than 33% of districts serving fewer than 2,000 students had computers, while over 67% of districts serving over 5,000 students had computers. The relationship between computer access and district socio-economic status is even greater. Thirty percent of districts with fewer than 5% of their students under the poverty line, had computers; compared to 12% of districts with over 25% of their students below the poverty line. Twenty-one percent of districts with 5-11% of students below the poverty line had computers, while 17% of those with 12-25% of students below the poverty line, had computers. The amount of federal funds a district had, did not appear to be positively related to their use of computers; if there was any relationship, it was a slightly negative one (Market Data Retreval, 1981).

Socio-economic issues are related to how computers are used as well as to if they are used. Currently there are three major models of computer use in education. These are the student as programmer, the student as user of existing software programs and the student as computer aware person. Unfortunatly programming has generally been seen as the perview of the gifted and talented or higher socio-economic status students, while drill and practice computer-assisted instruction has been more frequently found with "disadvantaged" students. For example a California survey of computer use in education found that children from lower socio-economic strata were more apt to be using computers to develop lower level skills than were students from higer strata. When parents' occupational status was rated 1,2 or 3, with 3 being the highest rating, the average rating of students using the computers

for computer-assisted instruction was 2.19, while for those learning computer literacy, it was 2.32. Other breakdowns were; games and simulations-2.28, programming -2.35, creative approaches-2.40, reading-2.08, vocational work-2.12 and math drills-2.16 (Euchner, 3/2/1983).

Watt (1983) came to similar conclusions, finding more affluent suburbs more apt to use computers for programming and computer awareness, while less affluent urban and rural areas were more apt to use computers for computer-assisted instruction. Indeed, he concluded that computers, as they are currently used, may reinforce existing socio-economic inequities rather than fostering educational equity.

Even within suburban districts, there are differences in who uses the computer and how. The Andover, MA model where gifted children learn how to program, while average students learn computer awareness, is a model that is followed by many districts. Of the teachers responding to the National Education Association survey on computers, 33% use the computer to teach computer literacy while 77% use it for computer-assisted instruction (Norman, 1983).

Access to computers is also decided by geographic location. The National Assessment of Educational Practice found the least amount of computer use in the south. Nationally, by the time they are 13, 23% of students have used the computer; in the south, that figure is 12%. Minnesota is the most active of the states, exposing 95% of the students to computers, prior to their graduation from high school. Other active states include Alaska, California, Deleware, Florida, North Carolina and Texas (Euchner, 2/16/1983).

While socio-economic status and even geographic location have an influence on student access to computers, there are other variables, such as sex and ethnic background that even more directly influence computer use. For

example, although 50% of the students in school are female, over two thirds of the students learning about computing are male (Computer Literacy, 1983). Girls are being kept out of the computer revolution. Keeping girls away from computers starts early and is often unconscious. For example, in Michigan a group of pre-school boys created a computer club and would not let girls, in the class, have access to the machine. In other schools the more aggressive males have been found to usurp access, to compuers, from the less aggressive girls. In yet other schools, computers are presented as advanced math electives, taken by few math anxious young women (Kiesler et.al.,1983).

Stereotypes have played a major role in determining who uses the computer and how. The stereotype that boys are stronger than girls, means that boys are more frequently chosen to help bring the computer to the classroom. Another accepted stereotype, that boys are more mechanical, means that it is the boys who are asked to help set up the computer and "introduce it to the class".

When boys alone introduce a new idea or object to a class, then both boys and girls have a tendency to view it as an activity for boys, not girls (Greenberg, 1978). Thus boys get more involved with the computer, stereotypes are supported and computer use is limited.

Things are changing. Teachers are setting up rules to determine who can use the computer and for how long. Under these rules girls are spending as much time as boys, on the computer (Kiesler, Sproull and Eccles, 1983). Educators are presenting computers with an "art" orientation rather than one of science and math and girls' interests are increasing (Berger, 1983). Programmers are beginning to become aware that girls are more attracted to

non-violent games and organizations such as Computers for Girls are begining to develop and distribute such software. As more female teachers become involved with computers, the number of role models for girls are increasing. Most "hackers" are still male, but more and more females are joining the fold (James, 1982).

While more girls are becoming involved with computers, they, and the boys, are still overwhelmingly white and native English speakers. There are a variety of reasons for this. First, and prehaps most importantly, the poorer districts, mentioned earlier as having less access to computers, are also the districts that are most apt to have large numbers of minority students. Too, more and more students are learning about computers by participating in the ever growing number of private computer camps, after school and weekend programs. Again, almost all of the students who attend these programs are white, native English speakers. Most minority parents just don't have the resources to allow their children to participate in these programs (Learning, 1982). Minority children are also underrepresented in the ranks of those defined as gifted and talented, the group most apt to learn programming in school.

Things are particularly serious for students whose native language is not English. Because, in part, of selection procedures that are based on English standardized tests, these students are severly underrepresented in gifted and talented programs. They are also limited in their use of computer-assisted instruction by the almost total lack of software in Spanish or almost any language other than English or French. Even the ability of these students to learn about computers is impaired by the lack of materials in Spanish, the lack of information on using computers with bilingual classes and the lack of

role models. Parents, of students whose native language is other than English, are more likely to be poor and unable to afford their own computers or private training. And these schools are the also the least apt to have computers. In terms of computers and computer use in education, the non-English dominant student is just left out.

The exclusion of these students and others, from access to computers has serious implications for education as well as equity. Computers have been found to be very effective aids to learning. Studies of computer-assisted instruction have concluded that "there appears to be rather strong evidence for the effectiveness of CAI over traditional instruction where effectiveness is measured by standardized achievement tests" (Jamison, et.al., 1973).

While these studies were done on larger mainframe computers, more recent studies, using micro-computers, have found similar results, with an additional benefit of being more cost-effective (Pitschka and Wagner, 1981). More recent studies of computer-assisted intruction have been found to increase speed of learning as well as achievement (Lipkin, 1983).

There have been some indications that computer-assisted instruction can also be of assistance in learning second languages. While work has not been done at the elementary level, work has been done, at the college level, teaching English speakers French, German and Russian (Allen, 1973). Evaluations of these programs have found computers having a positive effect on student second language learning (Allen, 1973).

Although less studied, learning to program appears to have even greater educational benefits. Students who learned to program in BASIC were found to score significantly higher on standardized math tests than did a control group

(Canuto, 1981). Young programmers have also been found to become better problem solvers, than their non-programming classmates (Lipkin, 1983). And of course, the motivating effects, the stories of students who give up lunch, stay after school and do almost anything to work on the computer, are well known.

While the inclusion of all students, in computer education, is a simple matter of justice, it is also a matter of national need. When government officals and others talk about the need for a technologically literate population, they are not excluding those who are female, poor or whose native language is other than English. Indeed this year, the federal government is funding model projects to incorporate technology, including computers, in bilingual education programs.

The computer, if properly used can be a powerful tool for educational equity as well as for educational achievement. However if computer use is limited; if the computer serves primarily white, English dominant males, from higher socio-economic backgrounds, then we are increasing the schism between have and have not students and as educators, we are failing. As one eight year old girl explained; "Someday I'll need to use a computer badly. People will give me one and I won't know how to use it. I want to learn now." We need to help her do that.

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